

**Fishery Data Series No. 94-36**

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# **Sitkoh Creek Steelhead: 1993 Escapement and Harvest**

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**Roger Harding**

and

**Doug Jones**

October 1994

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Alaska Department of Fish and Game

Division of Sport Fish



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Division of Sport Fish  
Anchorage, Alaska

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## ABSTRACT

The escapement of adult steelhead *Oncorhynchus mykiss* to Sitkoh Creek in 1993 was counted at a weir located about 0.5 km upstream of the mouth of the creek. Five hundred and twenty fish were counted from April 10 to June 1; the mid-point of the immigration occurred on May 1, 1993. The 1993 escapement was 37% less than the mean weir counts of 1936, 1937, 1982, and 1990. All 520 steelhead were sexed, and 183 were randomly sampled for lengths and ages. Of the randomly subsampled fish, 64% were females which averaged 777 mm long (SE = 6.4 mm); males constituted 36% of the subsample and averaged 759 mm long (SE = 12.7 mm). The total escapement (520 steelhead) was composed of 63% female and 37% male.

First-time spawners constituted 53% of the sampled escapement, repeat spawners constituted 45%, and 2% were unreadable. Fifty-eight percent of the nine complete age classes (i.e., freshwater age not regenerated) of repeat spawners were ages 3.2S1 (33%) and 4.2S1 (25%). Between May 11 and June 1, 1993 (when the weir was dismantled) a total of 332 steelhead kelts passed downstream through the Sitkoh Creek weir.

An on-site creel survey estimated a total 342 angler-hours (SE = 82) to have been expended at Sitkoh Creek between April 19 and May 31; an estimated 84 steelhead (SE = 22) were caught and released (Sitkoh Creek was closed to harvest in 1993).

KEY WORDS: Sitkoh Creek, steelhead, *Oncorhynchus mykiss*, escapement, weir, creel survey, Sitka, Southeast Alaska, Chichagof Island, AWL, age-weight-length, rainbow trout, harvest.

## INTRODUCTION

Sitkoh Creek, on Chichagof Island in northern Southeast Alaska (Figures 1 and 2), has an average steelhead escapement of 824 (Table 1) and supports a popular steelhead sport fishery. Sitkoh Creek attracts steelhead anglers from all urban centers of northern Southeast Alaska, with most of them coming from Sitka (Jones 1983).

Foot surveys of Sitkoh Creek escapement have been conducted annually since 1983 to index the number of adult steelhead in the Sitkoh system (Table 1). The average number of adult steelhead observed in reliable or "good quality" foot surveys (i.e., good light conditions, low water, and good visibility) is 74 (SD = 46). Because of relatively low counts obtained during foot surveys since 1988, weirs were used in 1990, and again in 1993, to determine if the population is deviating from past weir counts (Table 1).

In 1936, 1937, 1982, and 1990, weirs were used to count the number of steelhead entering Sitkoh Creek during the spring. The resultant counts for those years were 760, 1108, 770, and 661 steelhead, respectively (Table 1). However, comparable foot surveys were not conducted during weir operations in 1990. A low-water event combined with the weir operation delayed the kelt outmigration, causing an erroneous count (A. E. Schmidt, Alaska Department of Fish and Game, Sitka, Alaska, personal communication). Thus, the weir count of steelhead entering Sitkoh Creek in 1993 provided an opportunity to correlate foot surveys with weir escapement counts.

Six creel surveys have been conducted at Sitkoh Creek since 1976 (1976, 1978, 1982, 1987, 1990, and 1991). These surveys have indicated that most of the Sitkoh Creek steelhead fishery occurs in the lower sections of the creek, but some effort occurs at Sitkoh Lake, where a U.S. Forest Service (USFS) recreational cabin is located (Figure 2).

Current plans call for periodic use of weir counts and creel surveys on the Karta River and on Sitkoh Creek to monitor steelhead escapement and provide a means to monitor the status of steelhead systems in Southeast Alaska.

The research objectives for 1993 were (1) to count the escapement of steelhead into the Sitkoh Creek system between April 1 and May 31, 1993, and (2) to describe the distributions of length and age for adult steelhead returning to Sitkoh Creek between April 1 and May 31, 1993.

## METHODS

### Escapement

Adult steelhead were caught in a trap as they passed upstream through an aluminum channel and picket weir erected 0.5 km above the mouth of Sitkoh Creek (Figure 2). Each steelhead caught was measured to the nearest 1 mm fork-length (tip of snout to fork of tail), and scales were removed for age analysis. Date, time of passage through the weir, sample number, sex (if possible), condition, and comments were also recorded.

Eight scales were collected, four from each side of the fish, from an area two scale rows above the lateral line on a diagonal line from the posterior end of

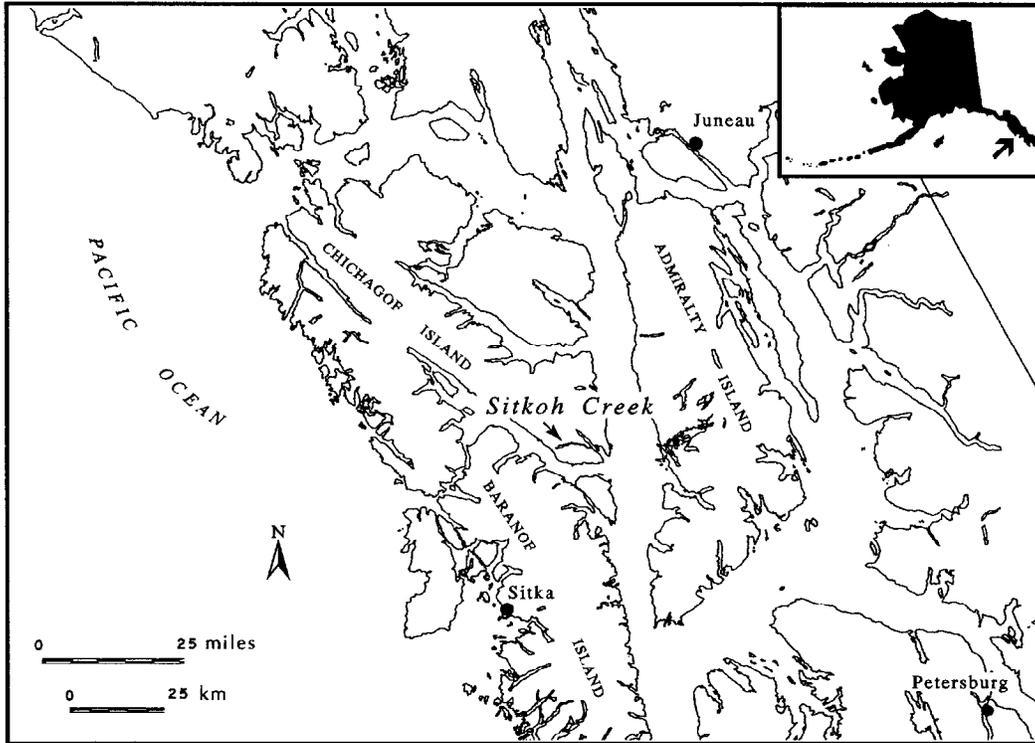


Figure 1. Location of Sitkoh Creek, northern Southeast Alaska.

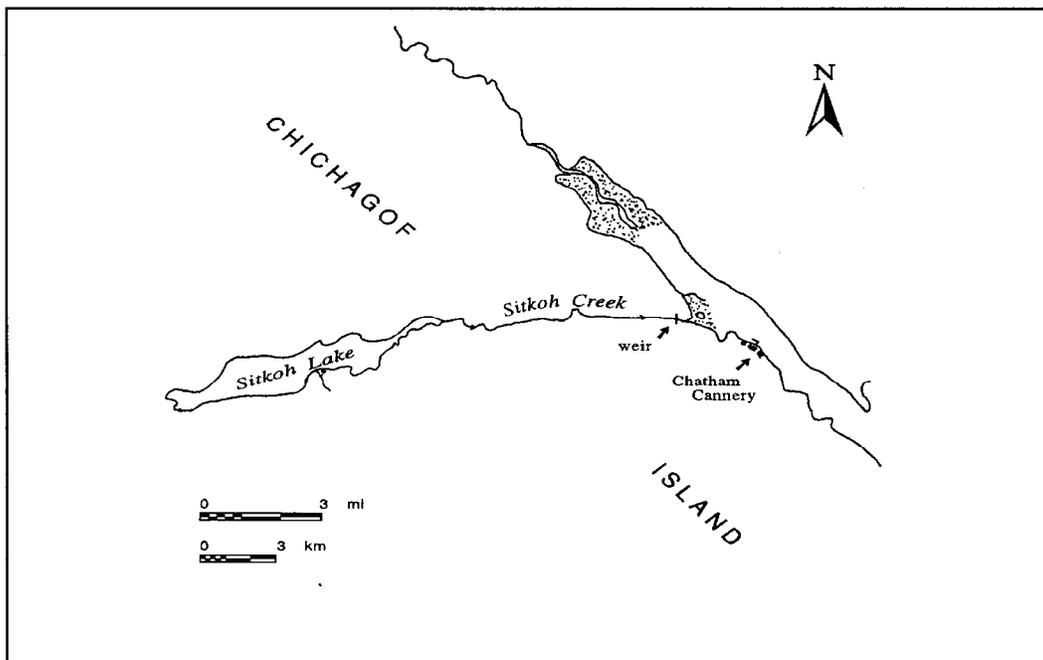


Figure 2. Location of weir at Sitkoh Creek, Chichagof Island, northern Southeast Alaska.

Table 1. Summary of weir and foot surveys for steelhead in Sitkoh Creek (Schmidt 1992).

Year	Weir count	Foot survey			Expanded estimate <sup>a</sup>
		Count	Date	Conditions	
1936	760				
1937	1,108				
1973		6	April 27	too early	
1976		33	May 17-18	good	386
1978		18	May 16		210
1979		17			199
1980		42			491
1981		42			491
1982	770	-- <sup>b</sup>			
1983		143	May 17	good	1,672
1984		92	May 11	good	1,076
1985		115	May 21	good	1,345
1986		58	May 21	late count	678
1987		107	May 20	good	1,251
1988		17	May 24	high water	200
1989		20	May 18	good	210
1990	661	NA <sup>c</sup>			
1991		40	May 14	good	468
1992		40	May 14	good	468
mean	824				

<sup>a</sup> Calculated from expansion factor determined during 1982 weir operation: foot counts were made during periods of known escapement. Foot counts averaged 8.55% of known escapement.

<sup>b</sup> Stream count of 45 on May 18 when weir count was 520, and stream count of 58 on May 30 when weir count was 685.

<sup>c</sup> Foot counts are not comparable, as fish were holding above the weir (A. E. Schmidt, Alaska Department of Fish and Game, Sitka, personal communication).

the dorsal fin to the anterior end of the anal fin (Paget 1920). Scale samples were mounted on gum cards, and triacetate impressions of the scales (7,000 kg/cm<sup>2</sup> pressure at a temperature of 97°C for 30 seconds) were prepared for use in determining age. Water temperature (nearest 1°C) and depth (nearest 0.5 cm) were measured 5 m downstream from the weir each morning.

Steelhead scales were aged using methods described by Narvar and Withler (1977). Repeat spawners were classified with an "S" after the ocean age to denote successful spawning and survival. For example, a steelhead aged as 3.2S1 was 6 years old: it spent 3 years (winters) in fresh water before emigration as a smolt and 2 years (winters) in salt water, then returned to fresh water as an adult, spawned ("S"), and survived another year in salt water before returning to fresh water on its second spawning run. First-time spawning steelhead are fish without an "S" in their total age designation.

The mean and standard errors for the lengths measured were calculated using standard procedures for normally distributed data (SAS 1985).

### Harvest Study

Two surveys, an on-site creel survey and a postal survey, were used to estimate the angler effort and catch of steelhead by anglers on the Sitkoh Creek system in 1993.

A stratified "direct expansion" creel survey based on randomized sampling of anglers completing their trips near the mouth of Sitkoh Creek was used to estimate angler effort and catch. April 19 was chosen as the creel survey starting day to best appropriate creel survey resources (i.e., man-hours) into the time period when fish and anglers were historically more abundant. The fishery was stratified into three biweekly periods (April 19 through May 2, May 3 through May 16, and May 17 through May 31) and into morning or afternoon periods, as catch and effort have been found to vary between early and late day (Jones et al. 1991). The survey thus has early/late days as primary units and anglers within days as secondary sampling units. When a primary unit (½ day) was selected for sampling, the entire period was to be sampled. The day began at 0700 hours and ended at civil twilight (averaged over the biweekly period). During each biweekly period, four of fourteen early and seven of fourteen late periods were randomly selected for sampling; previous Sitkoh Creek creel surveys have shown that more anglers completed their trip during the afternoon, or late, period; thus more resources were allocated to the late period.

The estimation of angler catch in stratum h was accomplished with the following formula. Estimation of angler effort used the same formula, with E substituted for C.

$$\hat{C}_h = D_h \bar{C}_h \quad (1)$$

$$\bar{C}_h = \frac{\sum_{i=1}^{d_h} \hat{C}_{hi}}{d_h} \quad (2)$$

$$\hat{C}_{hi} = M_{hi} \bar{C}_{hi} \quad (3)$$

$$\bar{C}_{hi} = \frac{\sum_{j=1}^{m_{hi}} C_{hij}}{m_{hi}} \quad (4)$$

where  $c_{hij}$  is the catch by angler  $j$  in sampling day  $i$  stratum  $h$ ,  $m_{hi}$  is the number of anglers interviewed in day  $i$ ,  $M_{hi}$  is the number of anglers completing trips in day  $i$ ,  $d_h$  is the number of days sampled in stratum  $h$ , and  $D_h$  is the number of days in stratum  $h$ . The variance of the harvest by stratum is estimated:

$$V[\hat{C}_h] = (1 - f_{1h}) D_h^2 \frac{\sum_{i=1}^{d_h} (\hat{C}_{hi} - \bar{C}_h)^2}{d_h (d_h - 1)} + D_h \sum_{i=1}^{d_h} M_{hi}^2 (1 - f_{2hi}) \frac{\sum_{j=1}^{m_{hi}} (C_{hij} - \bar{C}_{hi})^2}{d_h m_{hi} (m_{hi} - 1)} \quad (5)$$

where  $f_{1h}$  is the sampling fraction for days and  $f_{2hi}$  is the sampling fraction for anglers. Effort and catch estimates for seasonal strata were totalled to provide estimates for the entire season. The variance of the summed estimates is the sum of the variances.

A postal survey was used to estimate angler effort and catch of steelhead trout by anglers using the USFS cabin at Sitkoh Lake between April 1 and June 15, 1993. Names of cabins were obtained from USFS cabin reservation lists. Methods and questionnaire for the postal survey are presented in Jones (*in prep*).

## RESULTS

### Escapement

The weir was fish-tight on April 1, 1993. Five hundred and twenty (520) steelhead were counted upstream through the weir between April 10 and June 1, 1993, with the midpoint of the immigration occurring on May 1 (Figure 3 and Appendix A1). Three hundred and thirty-two (332) steelhead kelts were counted moving downstream through the weir after spawning (Appendix A1, Figure 4); however, fish were still emigrating when the weir was dismantled. The first fish passed downstream through the weir on May 11, and the midpoint of emigration occurred on May 20, when 114 fish were counted.

Water temperatures in Sitkoh Creek ranged from 1.5°C on April 2 to 13.0°C on June 1, with temperatures consistently above  $\geq 4.0^\circ\text{C}$  after April 21. Water levels ranged from 44 cm on May 1 to a low of 16 cm on June 1 (Appendix A1).

All 520 immigrant steelhead were sampled for sex (Appendix A2); 37% were males and 63% were females (Figure 5). Scales from 121 males and 181 females (302 total) were collected for age analysis. Four of the 302 scale samples (one from males and three from females) could not be aged, and freshwater age could not be determined for 84 of the remaining 298 (Appendix A2). Scale samples were collected from each immigrant between April 10 and April 24, every third fish between April 25 and May 6, and every other fish between May 7 and June 1. A subsample of 183 length and scale samples (118 female and 65 male) was selected to estimate the length and age composition of the Sitkoh Creek steelhead immigrants. The length and scale subsample was chosen to equally represent the

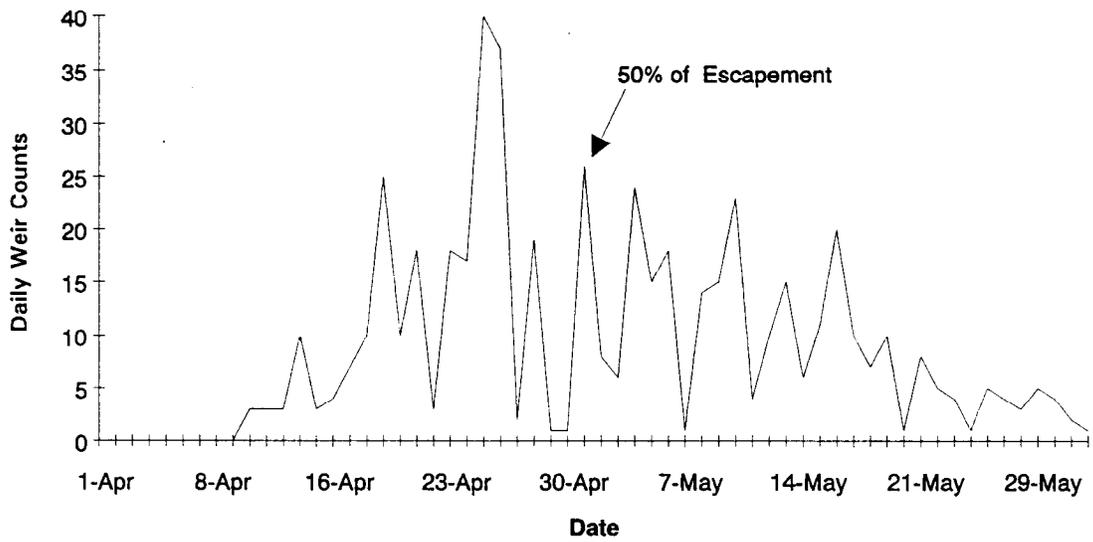


Figure 3. Escapement timing for steelhead at Sitkoh Creek weir, 1993.

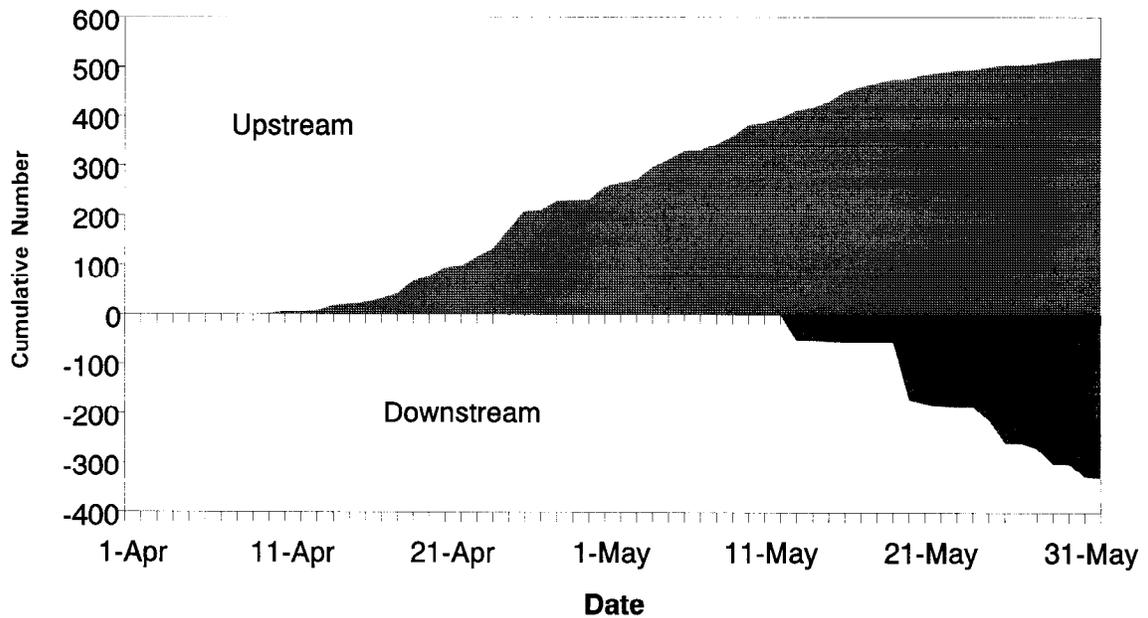


Figure 4. Cumulative number of steelhead counted through the Sitkoh Creek weir in 1993.

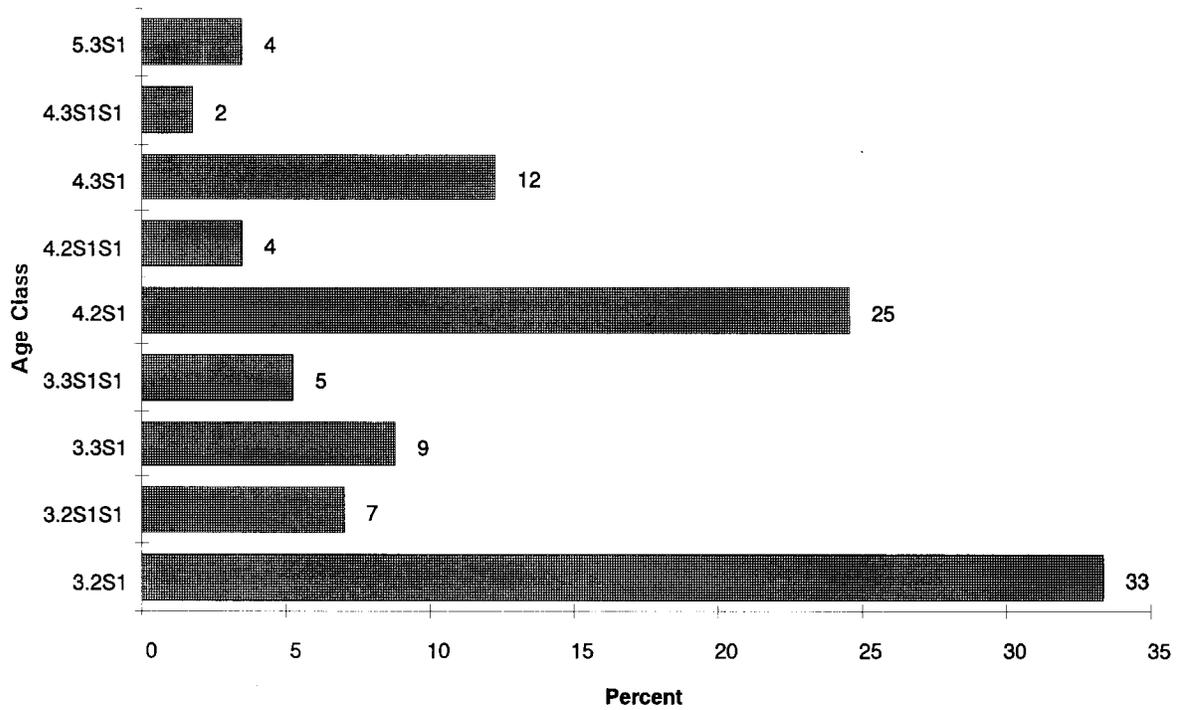
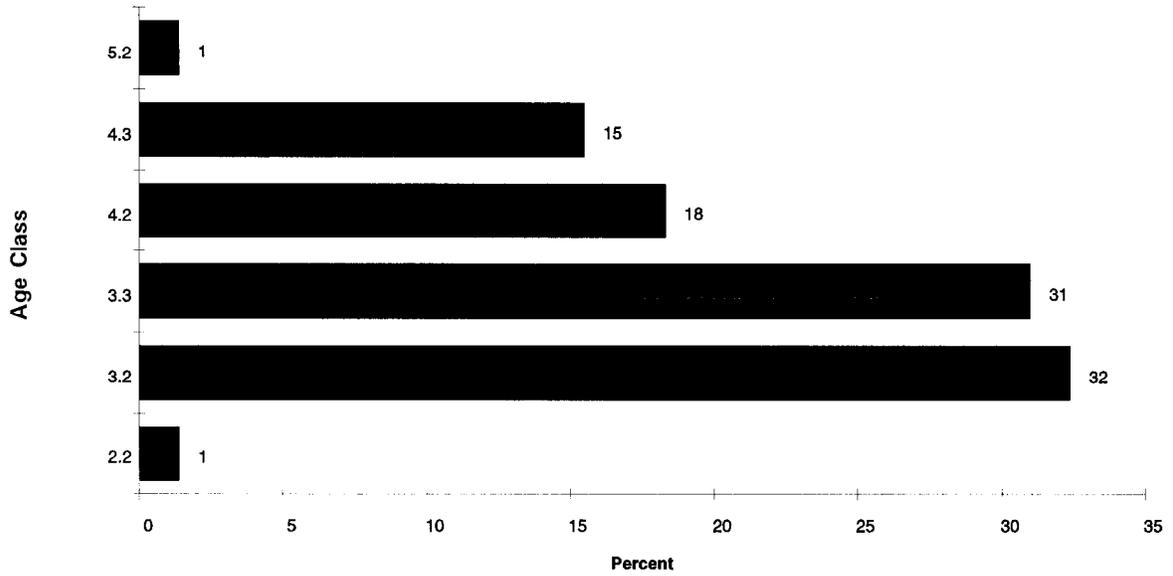


Figure 5. Percent age composition of first-time (above) and repeat (below) spawning steelhead in Sitkoh Creek, 1993. Only completely determined age classes are shown.

immigration and was selected as follows: every third fish between April 10 and April 24; every fish between April 25 and May 7; and four out of six fish between May 8 and June 1.

Fifty-three percent (53%) of the immigrants were first-time spawners; of the fully readable scales (i.e., not regenerated) from first-time spawners, 32% were age 3.2, 31% were age 3.3, 18% were age 4.2, 15% were age 4.3, 1% were age 2.2, and 1% were age 5.2. The freshwater portion of the scales was regenerated (R) on 27% of first-time spawners (23% R.3 and 4% R.2) and 31% of repeat spawners (Table 2, Figure 5). Forty-five percent (45%) of the immigrants were repeat spawners and represented nine different age classes. Ages 3.2S1 and 4.2S1 accounted for 58% of the non-regenerated scales of repeat spawners; 3.3S1 and 4.3S1 accounted for 21%. First-time and repeat spawning females (n = 118) averaged 777 mm fork length (SE = 6.4 mm); males (n = 65) averaged 759 mm fork length (SE = 12.7 mm) (Table 2).

Adult steelhead returning to Sitkoh Creek were examined at the weir for fresh or healed scars and wounds. These wounds were classified into seven categories (Table 3) based on descriptions and pictures presented in the Division of Commercial Fisheries Field Operations Manual (ADF&G *Unpublished*).

Fifty-one percent (51%) of the 520 fish examined at the weir were classified as having some type of wound (Table 3). Ninety-two fish (35% of the freshly injured or scarred fish and 16% of all fish) were classified as Category A. Category A scars are widely believed to be caused by an encounter with a gill net. The origin of scars in other categories is unknown, but they are believed to have been caused by fish, sea mammals, or other fishing activity.

#### Harvest Study

The on-site creel study was conducted with three biweekly periods as planned, between April 19 and May 31. Forty-six (46) anglers completed fishing trips during scheduled creel periods, and all but one were interviewed. An estimated 342 (SE = 81.6) angler-hours were spent to catch and release an estimated 84 (SE = 22.0) steelhead; no harvest was observed, as Sitkoh Creek was closed to harvest by Emergency Order (EO) in 1993. Results from the postal creel survey are presented in Jones (*In prep*).

## DISCUSSION

The 1993 steelhead escapement to Sitkoh Creek was 63% of historic weir counts (Table 1) and down 25% and 21%, respectively, from the most recent counts in 1982 and 1990. During a visual count of Sitkoh Creek on May 14, 1993, biologists observed 8-9% of the known number of steelhead in Sitkoh Creek (A. E. Schmidt, Alaska Department of Fish and Game, Sitka, personal communication). This compares closely to the correlation of visual and float counts at Sitkoh Creek in 1982, when 8.6% of the known number of steelhead were observed (Table 1).

Overall, the 1993 steelhead escapement into Sitkoh Creek appears similar to that in 1990 (Figure 6). The magnitude and timing of male immigrants were similar to those in both 1990 and 1982. The magnitude and timing of female steelhead immigration were nearly identical to those in 1990, until April 28, when the

Table 2. Age composition, mean length, and sex of steelhead sampled at Sitkoh Creek, 1993.

Age class	Female			Male			Comb.	% of grand total
	Length	n	SE	Length	n	SE	n	
<b>First-time spawners</b>								
2.2				650	1		1	0.6
3.2	683	10	27.6	638	13	15.9	23	12.6
3.3	756	16	10.8	814	6	18.8	22	12.0
4.2	684	5	34.4	664	8	18.2	13	7.1
4.3	779	9	11.0	814	2	71.5	11	6.0
5.2	730	1					1	0.6
R.2 <sup>a</sup>	615	2	35.0	650	2	5.0	4	2.2
R.3 <sup>a</sup>	773	15	9.1	816	7	20.0	22	12.0
Subtotal	740	58	8.9	712	39	15.5	97	53.0
<b>Repeat spawners</b>								
3.2S1	774	11	11.8	817	8	21.1	19	10.4
3.2S1S1	837	2	46.5	910	2	85.5	4	2.2
3.3S1	855	4	19.2	840	1		5	2.7
3.3S1S1	840	3	20.0				3	1.6
4.2S1	824	8	13.7	815	6	18.8	14	7.7
4.2S1S1	880	1		850	1		2	1.1
4.3S1	812	6	14.7	805	1		7	3.8
4.3S1S1	850	1					1	0.6
5.3S1	828	2	10.0				2	1.1
R.2S1 <sup>a</sup>	787	9	18.4	824	4	52.3	13	7.1
R.2S1S1 <sup>a</sup>	810	3	55.1	790	1		4	2.2
R.3S1 <sup>a</sup>	851	7	8.7	853	2	17.5	9	4.9
Subtotal	815	57	6.6	828	26	12.6	83	45.4
Unreadable	780	3	28.4				3	1.6
GRAND TOTAL	777	118	6.4	759	65	12.7	183	100.0

<sup>a</sup> R = Scales regenerated; freshwater age undetermined.

Table 3. Summary of marks and scars observed on adult steelhead sampled at Sitkoh Creek weir, 1993.

Category <sup>a</sup> and status	n	% of scarred fish	% of sampled escapement <sup>b</sup>
A fresh	2	0.8	0.4
A healed	77	29.2	14.8
B healed	7	2.7	1.4
C fresh	1	0.4	0.2
D healed	1	0.4	0.2
E fresh	5	1.9	1.0
F fresh	2	0.8	0.4
F healed	69	26.1	13.3
G healed	75	28.4	14.4
<u>Fish with 2 scars</u>			
D fresh / A healed	2	0.8	0.4
E fresh / A healed	1	0.4	0.2
E healed / A healed	1	0.4	0.2
F fresh / A healed	1	0.4	0.2
F healed / A healed	6	2.3	1.2
F healed / E healed	1	0.4	0.2
G healed / A healed	3	1.1	0.6
G healed / B healed	1	0.4	0.2
G healed / E fresh	1	0.4	0.2
G healed / F fresh	1	0.4	0.2
G healed / F healed	4	1.5	0.8
<u>Fish with 3 scars</u>			
B fresh & healed / E fresh	1	0.4	0.1
A healed/ E fresh/ G healed	1	0.4	0.2
A healed/ F healed/G healed	1	0.4	0.2
Total number scarred fish	264	100.0	51.0

<sup>a</sup> Category A: One or more fairly well delineated linear marks between the head and the dorsal fins, approximately perpendicular to the longitudinal body axis and encircling or partially encircling the body. Probably caused by gill net (Dave Gaudet, Alaska Dept. of Fish and Game, Juneau, personal communication).  
Category B: A series of approximately parallel mark or scrape lines over a substantial portion of the body; two or more series of such marks occurring at different angles may give the appearance of crosshatching marks.  
Category C: A fairly well delineated scrape band generally occurring between the head and the dorsal fin, approximately perpendicular to the longitudinal body axis or angled slightly backward from top to bottom of body and containing a nearly oval-shaped open wound, normally in the upper portion of the body.  
Category D: Extensive descaling of at least 25% or more of one or both sides of the body but with no delineated marks or wounds.  
Category E: Open, gaping wounds or puncture marks located anywhere on the body either with no marks and scrapes or with adjacent irregular "scratch" or "claw" marks, but no marks as described above in categories A-D.  
Category F: Scars/marks not fitting the descriptions in any other category.  
Category G: A fresh or healed appearing wound on either side of the body; usually a couple of inches in length, and angled dorsally and forward toward the head of the fish, from the anterior insertion of the dorsal fin to the front of the anal fin and behind the ventral fin. May also occur elsewhere on the fish, but angle of cut is usually consistent with ones described above. The fresh wound will have flesh exposed the whole length of cut. The healed scar will have an "indentation" or "pucker" type scar wherever it is located.

<sup>b</sup> Total sampled escapement = 520.

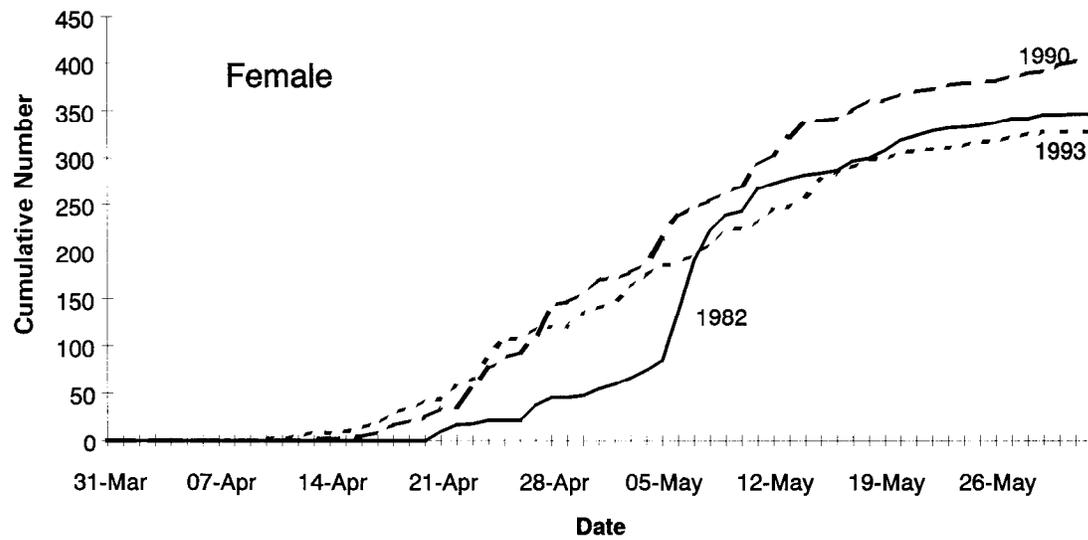
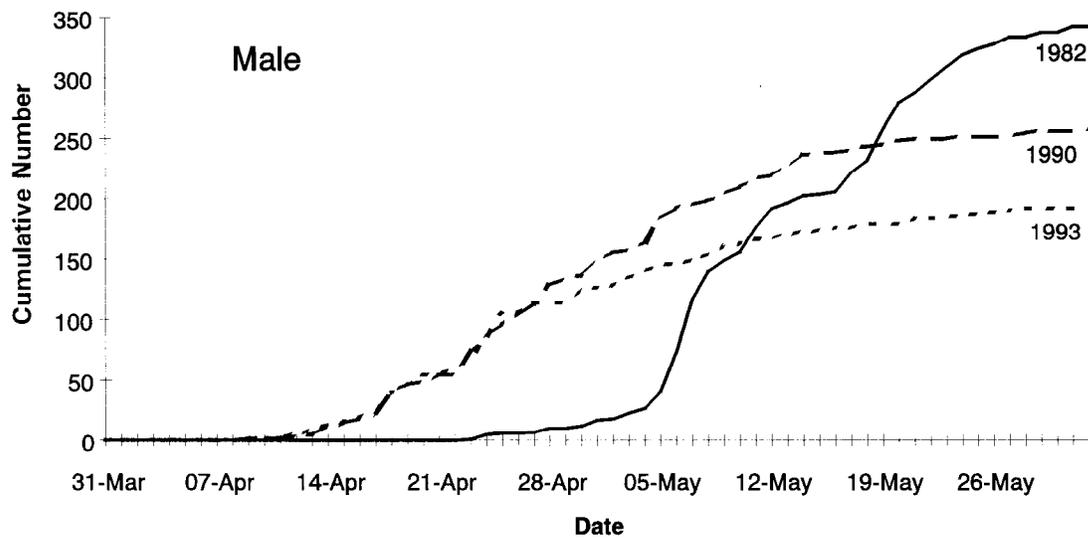


Figure 6. Cumulative number of male (Top) and female (bottom) steelhead passed through Sitkoh Creek weir in 1982, 1990, and 1993.

number of female immigrants dropped off; in 1983 the strongest female immigration occurred after May 5 (Figure 5).

Estimated angler effort expended at Sitkoh Creek has decreased by 72% since 1990, and by 60% since 1991 (Table 4). The stream was closed by EO to harvest of steelhead in 1992 and 1993. Sitkoh Creek continues to have one of the highest catch rates in Southeast Alaska (Table 4). The catch rate (CPUE) for Sitkoh Creek steelhead in 1993 (0.24 steelhead/hour) was very similar to that of 1990 (0.23 steelhead/hour), but down from the 1991 rate of 0.36 steelhead/hour. The EO prohibiting harvest of steelhead at Sitkoh Creek in 1993 may have contributed to the decrease in total estimated angler effort.

A feasibility study was conducted at Sitkoh Creek in 1993 to (1) assess the movement of sport-caught steelhead from lower river holding areas—where the vast majority of effort occurs—through the weir; and (2) to develop techniques for a future catch-and-release study.

While no quantitative data were generated from this study, several observations were made. Eighteen steelhead were caught with standard sport fishing gear in the lower river holding area, tagged by a variety of methods, and released; nine of these passed through the weir from 1 to 10 days (average of 5.5 days) later. The other nine steelhead may have died or lost their tags and passed unobserved upstream, the secondary mark (upper caudal punch) overlooked, or left the system and entered another steelhead system in Sitkoh Bay.

During the feasibility study at Sitkoh Creek several steelhead were captured multiple times with sport fishing gear. One steelhead was recaptured 1 day later approximately 80 m upstream of its release site; another was recaptured 3 days later 80 m upstream. Another was caught three times; the second capture occurred 10 days later in the exact location, and the third capture only 3 hours after the second, and 40 m downstream. The steelhead caught three times was reported to have fought equally as hard all three times and was passed upstream through the weir 11 hours after being caught and released the third time.

Several different tags and tagging methods were tried, to determine which methodology would work best in future catch-and-release studies. The preferred tag was a single #4 barbed hook with a unique color pattern (yarn) attached to the hook. The hook was inserted through the posterior base (peduncle) of the dorsal fin while the fish was being held in a landing net. If the number of fish to be tagged were large, the color pattern could be replaced with a uniquely numbered tag. The entire capture and tagging procedure could be accomplished by one person with this methodology, but for this study a two-person effort was preferred.

In the 1993 study, technicians collected genetic samples from steelhead smolt and resident rainbow trout in Sitkoh Creek. A graduate student will compare Sitkoh Creek genetic samples with samples from fish in other streams (C. L. Imboden, Alaska Department of Fish and Game, Douglas, Alaska, personal communication).

A summary of length and age of juvenile steelhead sampled for baseline genetic data is presented in Appendix A3 and A4.

Table 4. Steelhead catch rates (CPUE = [kept + released] ÷ effort) in selected Alaska streams, 1982 through 1992.

Year	Location	Effort	Steelhead		CPUE	Ratio released to kept
			Kept	Released		
1982 <sup>a</sup>	Anchor	29,079	375	667	0.04	1.8
1985 <sup>b</sup>	Situk	10,434	362	2,695	0.29	7.4
1986 <sup>c</sup>	Situk	12,283	287	2,094	0.19	7.3
1987 <sup>d</sup>	Situk	10,542	391	3,797	0.40	9.7
1988 <sup>e</sup>	Situk	16,379	423	4,991	0.33	11.8
1989 <sup>f</sup>	Situk	10,988	361	2,055	0.22	5.7
1990 <sup>g</sup>	Situk	14,907	392	1,317	0.11	3.4
1991 <sup>h</sup>	Situk	4,618	NA <sup>i</sup>	1,055	0.23	NA <sup>i</sup>
1988 <sup>j</sup>	Thorne	2,331	67	93	0.07	1.4
1990 <sup>k</sup>	Thorne	3,070	111	142	0.08	1.3
1988 <sup>l</sup>	Ward	3,638	359	971	0.37	2.7
1989 <sup>m</sup>	Ward	4,778	384	293	0.14	0.8
1989 <sup>n</sup>	Karta	1,568	50	124	0.11	2.5
1992 <sup>s</sup>	Karta	1,939	18	196	0.11	10.9
1989 <sup>o</sup>	Peterson	2,121	22	17	0.02	0.8
1990 <sup>p</sup>	Peterson	2,865	18	16	0.01	0.9
1990 <sup>q</sup>	Sitkoh	1,205	35	243	0.23	6.9
1991 <sup>r</sup>	Sitkoh	848	19	297	0.36	15.6
1993	Sitkoh	342	NA <sup>i</sup>	84	0.24	NA <sup>i</sup>

<sup>a</sup> Wallis and Balland (1984).

<sup>b</sup> Mecum and Suchanek (1986). Survey missed the early part of the run. Informal surveys indicated at least 2,230 hours of effort expended to harvest 66 steelhead and release another 1,889 steelhead between 4/15 and 4/29 (Bob Johnson, Alaska Dept. of Fish and Game, Yakutat, personal communication).

<sup>c</sup> Mecum and Suchanek (1987).

<sup>d</sup> Bingham et al. (1988).

<sup>e</sup> Suchanek and Bingham (1989).

<sup>f</sup> Johnson and Marshall (1990).

<sup>g</sup> Bob Johnson, Alaska Dept. of Fish and Game, Yakutat (personal communication).

<sup>h</sup> Glynn (1992). Survey is for peak of season only (April 8-June 2).

<sup>i</sup> Harvest of steelhead prohibited by emergency order.

<sup>j</sup> Freeman and Hoffman (1990); September 26, 1988 through June 4, 1989.

<sup>k</sup> Freeman and Hoffman (1991); October 23, 1989 through June 3, 1990.

<sup>l</sup> Hubartt (1989); February 29, 1988 through June 19, 1988.

<sup>m</sup> Hubartt (1990); October 10, 1988 through May 21, 1989.

<sup>n</sup> Hoffman et al. (1990).

<sup>o</sup> Harding and Jones (1990).

<sup>p</sup> Harding and Jones (1991).

<sup>q</sup> Jones et al. (1991).

<sup>r</sup> Schmidt (1992).

<sup>s</sup> Harding and Jones (1993).

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APPENDIX A



Appendix A1. Daily and cumulative weir counts for upstream- and downstream-migrating adult steelhead at Sitkoh Creek, 1993.

Date	Upstream				Downstream		Daily water	
	F	M	Daily	Cum.	Daily	Cum.	Temp	Depth
1-Apr	0	0	0	0	0	0	2.0	20
2-Apr	0	0	0	0	0	0	2.0	25
3-Apr	0	0	0	0	0	0	1.5	22
4-Apr	0	0	0	0	0	0	2.0	21
5-Apr	0	0	0	0	0	0	2.0	23
6-Apr	0	0	0	0	0	0	2.0	22
7-Apr	0	0	0	0	0	0	2.2	21
8-Apr	0	0	0	0	0	0	3.0	34
9-Apr	0	0	0	0	0	0	3.0	32
10-Apr	2	1	3	3	0	0	3.0	34
11-Apr	1	2	3	6	0	0	3.0	34
12-Apr	0	0	0	6	0	0	3.0	34
13-Apr	1	2	3	9	0	0	3.0	45
14-Apr	5	5	10	19	0	0	3.0	34
15-Apr	0	3	3	22	0	0	3.0	35
16-Apr	1	3	4	26	0	0	3.0	40
17-Apr	3	4	7	33	0	0	3.0	40
18-Apr	5	5	10	43	0	0	3.0	36
19-Apr	11	14	25	68	0	0	3.5	35
20-Apr	5	5	10	78	0	0	3.0	35
21-Apr	8	10	18	96	0	0	4.0	35
22-Apr	2	1	3	99	0	0	4.0	34
23-Apr	13	5	18	117	0	0	5.0	36
24-Apr	9	8	17	134	0	0	4.0	36
25-Apr	22	18	40	174	0	0	4.5	36
26-Apr	19	18	37	211	0	0	5.0	35
27-Apr	1	1	2	213	0	0	5.5	36
28-Apr	10	9	19	232	0	0	5.0	42
29-Apr	1	0	1	233	0	0	5.0	39
30-Apr	1	0	1	234	0	0	5.0	36
1-May	15	11	26	260	0	0	5.0	44
2-May	6	2	8	268	0	0	5.0	37
3-May	4	2	6	274	0	0	5.0	33
4-May	18	6	24	298	0	0	5.5	29
5-May	10	5	15	313	0	0	5.0	40
6-May	13	5	18	331	0	0	6.0	38
7-May	0	1	1	332	0	0	5.0	34
8-May	11	3	14	346	0	0	6.0	29

-continued-

Appendix A1. (Page 2 of 2).

Date	Upstream				Downstream		Daily water	
	F	M	Daily	Cum.	Daily	Cum.	Temp	Depth
9-May	10	5	15	361	0	0	6.0	29
10-May	16	7	23	384	0	0	6.0	25
11-May	2	2	4	388	1	1	6.5	24
12-May	7	3	10	398	0	1	5.5	22
13-May	13	2	15	413	54	55	6.0	21
14-May	3	3	6	419	0	0	7.0	25
15-May	9	2	11	430	2	57	8.0	29
16-May	19	1	20	450	1	58	10.0	31
17-May	8	2	10	460	0	58	9.0	38
18-May	6	1	7	467	0	58	9.5	31
19-May	8	2	10	477	0	58	10.0	28
20-May	1	0	1	478	114	172	12.0	29
21-May	7	1	8	486	8	180	10.5	34
22-May	1	4	5	491	6	186	12.0	31
23-May	3	1	4	495	2	188	11.0	28
24-May	1	0	1	496	0	188	11.0	24
25-May	3	2	5	501	26	214	11.5	24
26-May	3	1	4	505	46	260	11.0	21.5
27-May	0	0	0	505	0	260	11.5	20
28-May	2	1	3	508	11	271	11.0	19
29-May	3	2	5	513	31	302	11.0	18
30-May	3	1	4	517	0	302	13.0	17
31-May	2	0	2	519	27	329	13.0	20
1-Jun	0	1	1	520	3	332	13.0	16

Appendix A2. Length, age, and sex of the 520 adult steelhead sampled at Sitkoh Creek Weir, 1993.

DATE	LENGTH	AGE	SEX	COMMENTS <sup>a</sup>
4/10/93	870	4.3S1	F	NR,B,1H,6H
4/10/93	850	R.3	M	NR,SB,1H
4/10/93	730	4.2S1	F	B,NR,1H
4/11/93	850	3.2S1	M	SB,R,1H
4/11/93	975	3.3S1S1S1	F	R,B,1H, FRESH NOSE BITE FROM OTTER 5F 7 SCALES
4/11/93	850	3.2S1	M	B,NR (ONLY SEVEN SCALES)
4/13/93	655	3.2	M	SB,NR,SPLIT TAIL, SEAL BITE
4/13/93	870	3.3	M	SD,R,1H
4/13/93	784	4.3S1	F	B,NR,7H
4/14/93	780	3.2S1	F	NR,B,6H, PHOTO
4/14/93	840	3.2S1	M	SB,NR
4/14/93	860	R.2S1S1	M	SD,R
4/14/93	834	4.3S1	F	B,NR
4/14/93	700	3.2	M	SB,R,1H, PHOTO
4/14/93	670	R.2	M	R,B,6H, 2 PHOTOS
4/14/93	770	4.3	F	NR,B,NS
4/14/93	820	3.3S1S1	F	R,SB,NS
4/14/93	780	4.2	F	B,NR,6H
4/14/93	705	4.2	M	B,R,NS
4/15/93	640	4.2	M	B,R,NS
4/15/93	705	R.2	M	B,R,TAIL SCAR 7H
4/15/93	830	4.2S1	M	SD,NR, BELLY SCAR 6H
4/16/93	670	R.2	M	B,R,NS
4/16/93	758	R.2S1	M	SB,NR,6H, PHOTO
4/16/93	880	3.3	M	SB,R,1H PHOTO
4/16/93	755	R.3	F	B,NR,6H PHOTO
4/17/93	870	3.3	F	NR,B,6H PHOTO
4/17/93	812	3.3	M	SB,NR,1H, PHOTO
4/17/93	630	4.2	M	B,R,NS
4/17/93	710	4.3	F	B,NR,NS
4/17/93	690	3.2	M	R,B,1H PHOTO
4/17/93	830	4.3	F	B,NR,1H, PHOTO
4/17/93	865	3.2S1	M	B,R,NS
4/18/93	995	3.2S1S1	M	SD,NR,NS
4/18/93	890	R.2S1S1	F	B,NR,1H
4/18/93	620	R.2	M	SB,NR,1H
4/18/93	650	2.2	M	B,NR,NS
4/18/93	590	3.2	M	SB,R,1H
4/18/93	840	3.3	M	SB,NR,1H, TWO PHOTOS, TRR
4/18/93	805	3.2	F	B,NR,1H
4/18/93	800	3.3S1S1	F	B,NR,1H
4/18/93	795	3.2	F	B,R,1H,5H, TWO PHOTOS
4/18/93	875	4.2S1	F	B,NR,1H,TRR, PHOTO
4/19/93	836	4.3S1	F	B,NR,HOOK IN MOUTH,PART OF CAUDAL BASE.
4/19/93	870	4.3	M	DR,R,NS
4/19/93	750	R.3	M	B,R,7H
4/19/93	800	3.3	F	B,NR,NS
4/19/93	600	3.2	M	B,R,NS
4/19/93	720	R.3	F	B,NR,1H
4/19/93	760	3.3	F	B,NR,7H,TRR
4/19/93	690	3.2	M	B,R,NS
4/19/93	770	4.3S1	F	B,NR,7H, PHOTO-#4
4/19/93	690	4.2	M	B,R,7H, PHOTO-#5&#6
4/19/93	840	3.3	M	SD,R,7H

-continued-

Appendix A2. (Page 2 of 10).

DATE	LENGTH	AGE	SEX	COMMENTS <sup>a</sup>
4/19/93	644	3.3	F	B,R,7H
4/19/93	772	4.2S1	M	SB,R,NS
4/19/93	894	4.3	M	SB,R,1H, PHOTO #9
4/19/93	778	3.2S1	F	B,NR,7H
4/19/93	678	4.2	M	B,R,1H,7H,? PHOTO #10
4/19/93	655	4.2	M	B,R,1H
4/19/93	765	3.3	F	B,R,7H
4/19/93	635	4.2	M	SB,R,1H
4/19/93	940	4.2S1S1	M	D,R,5F, 2 SCALES MISSING PHOTO #11
4/19/93	758	3.2S1	F	B,NR, 1H FAINT
4/19/93	640	5.2	M	B,NR,PAN JET EASY TO SEE, SHRIMP TAG 204 FELL OUT
4/19/93	650	4.2	F	B,NR,NS
4/19/93	750	R.3	M	D,R,1H FAINT
4/19/93	710	4.2S1	F	B,NR,6H
4/20/93	840	4.3	M	D,R,6H, PHOTO
4/20/93	820	3.3S1S1	F	SD,R,NS
4/20/93	785	R.2	F	B,NR,5F,2F,2H, TRR, PHOTO
4/20/93	825	R.3	M	D,R,1H
4/20/93	800	4.3S1	F	B,NR,6H
4/20/93	930	4.2S1S1	M	SD,NR,7H,TRR, PHOTO #16 & #17
4/20/93	729	3.3	M	D,R,TRR
4/20/93	790	3.2	M	SD,NR,7H
4/20/93	875	3.3S1	F	SB,NR,1H, PHOTO #18
4/20/93	875	3.2S1	F	B,NR,1H PHOTO 19 & 20
4/21/93	880	3.3S1S1	F	B,NR,1H FAINT
4/21/93	820	R.3	M	D,R,1H BOTH SIDES FAINT
4/21/93	720	4.2	M	SB,R,7H
4/21/93	725	3.2S1	M	D,R,2H BOTH SIDES FAINT
4/21/93	660	3.2	M	B,R,7H BOTH SIDES
4/21/93	670	4.2	M	SB,R,1H TORN DORSAL, UPPER CAUDAL MISSING
4/21/93	880	R.2S1	F	SD,R,1H,7H, DRIPPING EGGS
4/21/93	840	R.3S1	F	B,NR,1H,7H FAINT
4/21/93	760	5.2S1	M	D,R,2H BOTH SIDES, CROSS HATCHING
4/21/93	750	R.3	F	SB,NR,7H FAINT
4/21/93	720	R.2	F	B,NR,6H
4/21/93	785	4.2S1S1	F	B,R,7H FISH NOT SEXED
4/21/93	625	3.2	M	B,R,NS
4/21/93	590	4.2	F	B,R,NS
4/21/93	640	4.2	M	SD,R,1H,7H
4/21/93	824	3.2S1S1	M	SB,R,6H
4/21/93	788	R.2S1	M	D,NR,7H,2H
4/21/93	715	4.2S1	F	B,NR,NS
4/22/93	790	R.2S1S1	M	SD,R,7H PHOTO
4/22/93	895	R.3S1	F	B,NR,NS,TRR
4/22/93	740	3.3	F	SB,NR,1H,TRR, TWO PHOTOS
4/23/93	742	4.3	M	SD,R,NS
4/23/93	670	4.2	M	D,R,1H,TRR, PHOTO
4/23/93	757	3.2S1	F	SD,R,7H,TRR, PHOTO
4/23/93	828	3.3	M	SD,R,6H
4/23/93	860	R.2S1S1	F	SB,NR,7H,1H, TWO PHOTOS
4/23/93	725	3.3	F	SB,NR,7H,PHOTO #31
4/23/93	790	4.3	F	SB,R,1H FAINT
4/23/93	800	4.3	F	B,NR,1H
4/23/93	870	3.3	F	6F
4/23/93	810	3.3S1	F	NR,NS

-continued-

## Appendix A2. (Page 3 of 10).

DATE	LENGTH	AGE	SEX	COMMENTS <sup>a</sup>
4/23/93	830	R.3S1	F	SB,NR,NS
4/23/93	615	4.2	F	B,R,6H,TRR
4/23/93	850	4.2S1S1	M	SD,R,NS
4/23/93	820	3.2S1	F	SB,R, HALF OF ANAL FIN MISSING
4/23/93	855	R.2S1	M	SD,R,6H
4/23/93	818	5.3S1	F	SB,R,NS
4/23/93	850	R.2S1S1	F	B,NR,6H
4/23/93	700	4.2S1	F	B,R,NS
4/24/93	840	4.2S1	M	SD,R,6H,7H
4/24/93	900	3.3	M	SD,R,NS
4/24/93	745	R.3	M	SD,R,NS
4/24/93	795	3.3	F	SD,NR,NS
4/24/93	820	4.3S1	F	B,NR,NS
4/24/93	659	3.2	M	SB,R,NS
4/24/93	745	3.2S1	F	SB,NR,7H, PHOTO
4/24/93	780	5.2S1	F	B,R,NS
4/24/93	732	3.3	F	B,NR,NS
4/24/93	615	3.2	M	B,R,2H, PHOTO
4/24/93	660	3.2	M	B,NR,NS
4/24/93	820	4.3	F	B,NR,6H
4/24/93	820	3.2S1	F	B,NR,7H, PHOTO
4/24/93	780	3.3	F	SB,NR,1H
4/24/93	587	4.2	M	B,R,6H, PHOTO
4/24/93	818	R.3	M	SD,R,7H, PHOTO
4/24/93	675	3.3S1	F	B,NR,1H
4/25/93	852	3.2S1	F	B,NR,6H
4/25/93	730	3.2S1	M	B,NR,2H
4/25/93	870	R.3	M	SB,R,6H
4/25/93	605	3.2	F	B,NR,NS
4/25/93	850	R.2S1	M	SD,B,NS ??????
4/25/93	818	4.2S1	F	B,NR,NS
4/25/93	868	3.3S1	F	B,NR,NS
4/25/93	838	5.3S1	F	B,R,7H
4/25/93	730	4.2S1	M	SD,R,6H
4/25/93	810	3.3	F	B,NR,7H
4/25/93	835	R.2S1	M	SB,R,7H
4/25/93	630	3.2	M	SB,R,NS
4/25/93	788	R.3	F	B,NR,NS
4/25/93	800	R.3	M	SB,R,1H,ONLY 4 SCALES PER FISH FROM NOW ON
4/25/93			M	SB, SAMPLING EVERY THIRD FISH FROM NOW ON
4/25/93			M	SB, PASS
4/25/93	670	3.2	M	B,R,NS
4/25/93			F	B,NS
4/25/93			M	SD,R,NS
4/25/93	780	R.3	F	SB,R,1H, PHOTO, SPLIT DORSAL FIN
4/25/93			F	SB,R,NS
4/25/93			F	SB,NR,NS
4/25/93	830	4.3	F	B,NR,NS
4/25/93			F	B,NR,NS
4/25/93			F	SD,R,NS
4/25/93	760	R.2S1S1	F	B,NR,2H,7H, SPLIT,TORN DORSAL
4/25/93			M	B,R
4/25/93			M	SD,R
4/25/93	735	3.3	F	B,NR,6H
4/25/93			F	B,NR

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## Appendix A2. (Page 4 of 10).

DATE	LENGTH	AGE	SEX	COMMENTS <sup>a</sup>
4/25/93			M	SD,R
4/25/93	810	4.3S1	F	B,NR,NS
4/25/93			F	B,R
4/25/93			F	SB,NR
4/25/93	795	3.2S1	F	SB,NR,1H
4/25/93			M	B,NR
4/25/93			F	B,NR
4/25/93	875	3.2S1	M	SD,R,NS
4/25/93			M	SD,R
4/25/93			M	B,NR
4/26/93	810	R.3	F	SD,R,1H, PHOTO
4/26/93			F	B,NR
4/26/93			M	SB,R
4/26/93	820	REGENS	F	SB,NR, MISSING LOWER CAUDAL
4/26/93			M	B,NR
4/26/93			M	B,R
4/26/93	835	4.2S1	F	SB,NR,NS
4/26/93			F	B,NR
4/26/93			F	SB,R
4/26/93	645	R.2	M	SB,R,NS
4/26/93			F	B,NR
4/26/93			F	B,NR
4/26/93	845	R.2S1	F	SB,R,6H
4/26/93			M	B,NR
4/26/93			F	B,R
4/26/93	840	3.3S1	M	SB,NR,7H
4/26/93			M	SB,R
4/26/93			M	B,R
4/26/93	655	R.2	M	B,NR, MISSING 3/4 OF DORSAL FIN
4/26/93			F	B,NR
4/26/93			M	SD,NR
4/26/93	725	REGENS	F	SD,NR,1F,TRR, PHOTO
4/26/93			F	B,NR
4/26/93			M	SB,NR
4/26/93	870	R.3S1	M	SD,R
4/26/93			M	SD,R
4/26/93			M	SD,NR
4/26/93	900	3.3S1	F	SD,R,6H
4/26/93			M	SD,NR
4/26/93			F	SB,NR
4/26/93	650	R.2	F	B,NR
4/26/93			M	SD,NR
4/26/93			F	SB,NR
4/26/93	805	4.3S1	M	SB,NR,7H
4/26/93			M	SD,NR
4/26/93			F	SD,NR
4/26/93	760	4.3	F	B,NR
4/27/93			F	B,NR
4/27/93			M	SD,R
4/28/93	665	4.2	M	SD,R,7H
4/28/93			F	B,R
4/28/93			F	B,NR
4/28/93	810	3.2S1	M	SD,R,7H
4/28/93			M	SD,R
4/28/93			F	B,NR

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DATE	LENGTH	AGE	SEX	COMMENTS <sup>a</sup>
4/28/93	835	R.3S1	F	B,NR
4/28/93			F	B,R
4/28/93			F	B,NR
4/28/93	740	3.2S1	F	B,NR,1H, HOOK MARK ON SIDE
4/28/93			M	B,R
4/28/93			M	SD,NR
4/28/93	580	3.2	M	B,R,1H,6H
4/28/93			M	SD,R
4/28/93			M	SD,R
4/28/93	795	4.2S1	M	SD,R,6H
4/28/93			F	SD,R
4/28/93			F	B,NR
4/28/93	750	3.2	F	SB,NR,6H
4/29/93			F	SB,NR
4/30/93			F	B,NR
5/1/93	795	3.3	F	B,NR,NS
5/1/93			M	SD,R,TRR
5/1/93			M	D,R
5/1/93	835	R.3S1	M	SB,R,6H, PHOTO
5/1/93			M	B,R,NS
5/1/93			F	B,NR,NS
5/1/93	883	3.2S1S1	F	SB,R,6F, PHOTO
5/1/93			F	SD,NR,NS
5/1/93			M	SD,R,NS
5/1/93	770	3.3	F	B,NR,1H,7H
5/1/93			M	SD,NR,NS
5/1/93			M	SD,R,7H
5/1/93	785	4.3S1	F	B,NR
5/1/93			F	B,NR,1H, PHOTO
5/1/93			M	SD,R,1H
5/1/93	790	3.2S1S1	F	B,NR,NS
5/1/93			F	B,NR,NS
5/1/93			F	SD,R,6H
5/1/93	750	R.2S1	F	B,NR,6H
5/1/93			M	SD,R,1H
5/1/93			M	SD,R,NS
5/1/93	840	3.3S1	F	SB,NR,NS
5/1/93			F	SB,NR,1H
5/1/93			F	B,NR,NS
5/1/93	740	R.2S1	F	B,NR,NS
5/1/93			M	B,R,NS
5/2/93			M	SB,R,NS
5/2/93	780	3.2S1	F	SD,NR,6H
5/2/93			F	B,NR,7H, PHOTO 6
5/2/93			F	B,NR,1H, PHOTO 7
5/2/93	688	4.2	M	SB,R,6H, PHOTO 8 HOOK INJURY, TORN GILL PLATE
5/2/93			F	B,NR,NS
5/2/93			F	B,NR,NS
5/2/93	830	R.2S1	F	B,NR,5F, PHOTO 9
5/3/93			M	SD,R,NS
5/3/93			F	B,NR,1H, SPLIT TAIL
5/3/93	710	3.2S1	F	B,NR,7H
5/3/93			M	B,R,NS
5/3/93			F	B,NR,6H
5/3/93	780	R.3	F	B,NR,6H

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DATE	LENGTH	AGE	SEX	COMMENTS <sup>a</sup>
5/4/93			F	B,NR,1H
5/4/93			M	SB,NR,1H, TORN DORSAL
5/4/93	615	3.2	M	B,R,NS
5/4/93			M	SB,R, TORN DORSAL
5/4/93			F	SB,NR,6H
5/4/93	760	R.2S1	F	B,NR,6H
5/4/93			F	B,NR,NS
5/4/93			M	SD,R,NS
5/4/93	661	4.2	F	B,NR,6H
5/4/93			M	SD,R,NS
5/4/93			M	SD,R,7H
5/4/93	760	3.3	F	B,NR,NS
5/4/93			F	B,NR,1H
5/4/93			F	SB,NR,NS
5/4/93	805	4.3	F	B,NR,7H
5/4/93			F	B,NR,NS
5/4/93			F	B,NR,7H, TAIL NOTCHED
5/4/93	820	3.3S1S1	F	SD,R,7H
5/4/93			F	SB,R,NS
5/4/93			F	SD,NR,NS
5/4/93	810	R.3S1	F	B,NR,3F
5/4/93			F	SB,NR,NS
5/4/93			F	SB,R,NS
5/4/93	790	4.3	F	B,NR,NS
5/5/93			F	B,NR,6H ON TAIL
5/5/93			F	B,NR,NS
5/5/93	835	4.2S1	M	SD,R,6H
5/5/93			M	SD,R,NS
5/5/93			F	B,R,6H,1H
5/5/93	730	4.2	M	B,R,6H
5/5/93			F	B,NR,6H
5/5/93			F	SB,NR,6H,7H
5/5/93	770	4.2S1	F	B,NR,7H
5/5/93			F	B,NR,7H
5/5/93			F	B,NR,6H
5/5/93	820	3.2S1	M	SD,R,7H, SPLIT DORSAL
5/5/93			F	SD,NR,6F,1H
5/5/93			F	B,NR,1H, TORN GILL PLATE
5/5/93	880	R.3	M	SB,NR,NS
5/6/93			M	B,NR,6H
5/6/93			M	SD,R,NS
5/6/93	740	3.3	F	B,R,1H
5/6/93			F	B,NR,7H
5/6/93			F	B,NR,NS
5/6/93	810	R.3	F	B,R,NS
5/6/93			F	B,NR,6H
5/6/93			F	SB,NR,1H
5/6/93	840	3.3	M	SD,NR,1H
5/6/93			F	SD,NR,4H
5/6/93			F	B,NR,6H
5/6/93	795	REGENS	F	B,NR,NS
5/6/93			F	SB,NR,6H
5/6/93			M	SD,R,1H
5/6/93	750	3.2	F	B,R,6H
5/6/93			F	B,NR,6H

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DATE	LENGTH	AGE	SEX	COMMENTS <sup>a</sup>
5/6/93			F	B,NR,1H,7H
5/6/93			M	B,R,NS, DID NOT MEASURE
5/7/93			M	SB,R,7H
5/8/93	850	R.3S1	F	SB,NR,4F,1H,DESCALING
5/8/93			F	SB,NR,1H
5/8/93	857	4.2S1	M	SD,NR,NS
5/8/93			F	SD,NR,7H
5/8/93	800	3.3	F	SD,NR,1H,6H
5/8/93			F	B,R,6H, PHOTO
5/8/93	755	3.3	M	B,NR,6H
5/8/93			F	B,NR,7H
5/8/93	795	R.3	F	B,NR,7H
5/8/93			F	SD,NR,7H
5/8/93	750	4.2	F	B,NR,6H
5/8/93			F	SB,NR,7H
5/8/93	875	3.2S1	M	SD,R,6H
5/8/93			F	SB,NR,7H
5/9/93	840	4.2S1	F	B,R,7H
5/9/93			F	B,NR,6H
5/9/93	860	R.3S1	F	B,NR,7H, HOOK IN RIGHT PEC.
5/9/93			M	SB,R,NS
5/9/93	875	R.3S1	F	B,R,NS
5/9/93			F	SB,NR,NS
5/9/93	650	3.3	F	B,NR,1H
5/9/93			F	B,R,NS
5/9/93	875	4.3	M	D,R,7H, RED AND YELLOW TAG
5/9/93			F	SB,NR,7H
5/9/93	560	4.2	M	SB,R,NS
5/9/93			F	SB,NR,NS
5/9/93	640	3.2	M	SB,R,NS
5/9/93			M	SB,R,7H, RED AND BLACK TAG
5/9/93	785	R.3	F	B,NR, DORSAL FIN GONE
5/10/93	780		F	SB,R,1H, CAUGHT IN HOOP NET FROM DN. STREAM. HAD BARBED FLY IN
5/10/93	680	R.2S1	M	SD,R,NS
5/10/93			F	B,R,NS
5/10/93	625	3.2	M	SB,R,NS
5/10/93			M	SB,R,NS
5/10/93	650	4.2	F	B,NR,NS
5/10/93			M	SD,R,NS
5/10/93	770	R.2S1	F	SB,R,1H
5/10/93			F	SB,NR,NS
5/10/93	710	R.2S1	F	SB,NR,1H
5/10/93			M	SD,R,NS
5/10/93	630	4.2	F	SB,NR,6H
5/10/93			F	SB,R,NS
5/10/93	785	3.3	F	SB,NR,NS
5/10/93			F	SB,R,NS
5/10/93	670	R.3	F	SB,NR,1H
5/10/93			F	SB,NR,6H
5/10/93	788	R.3	F	SB,NR,NS
5/10/93			F	B,NR,NS
5/10/93	660	4.2	M	B,R,NS
5/10/93			M	SB,R,NS
5/10/93	872	4.2S1	F	SD,NR,7H
5/10/93			F	B,NR,NS

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DATE	LENGTH	AGE	SEX	COMMENTS <sup>a</sup>
5/11/93	855	R.3S1	F	B,NR,6H
5/11/93			F	B,NR,1H
5/11/93	560	3.2	M	SD,R,NS
5/11/93			M	SD,R,NS
5/12/93	780	R.3	F	B,R,NS
5/12/93			F	B,NR,NS
5/12/93	820	R.3	M	D,R,5F
5/12/93			F	SB,NR,NS
5/12/93	700	3.3	F	SB,R,4F,1H
5/12/93			M	SD,R,5F
5/12/93	820	4.2	F	B,R,NS
5/12/93			F	SB,NR,1H
5/12/93	845	R.3	M	SD,R,7H
5/12/93			F	B,NR,1H
5/13/93	630	4.2	M	SD,R,NS
5/13/93			F	B,NR,6H,1H
5/13/93	700	4.2	F	SB,R,6H,5H
5/13/93			F	SB,NR,6H
5/13/93	640	4.2	M	SD,R,NS
5/13/93			F	SB,R,1H
5/13/93	585	3.2	F	B,NR,NS
5/13/93			F	SB,NR,1F, PHOTO #3
5/13/93	750	R.2S1S1	F	SB,NR,NS
5/13/93			F	SB,NR,7H
5/13/93	790	4.2S1	F	SB,R,7H
5/13/93			F	SB,NR,NS
5/13/93	880	4.2S1S1	F	SB,R,1H
5/13/93			F	B,NR,NS
5/13/93	870	3.3S1	F	SB,R,1H,6H,7H
5/14/93			M	SD,R,NS, YELLOW TAG
5/14/93	755	REGENS	M	D,R,1H,5F,7H, RED GRAY TAG
5/14/93			F	B,NR,NS
5/14/93	885	4.3	M	D,R,NS
5/14/93			F	B,R,NS
5/14/93	760	3.2	F	B,R,6H
5/15/93			F	SD,NR,NS
5/15/93	670	4.2	M	SD,NR,NS
5/15/93			F	B,NR,7H
5/15/93	660	4.2	F	B,NR,7H
5/15/93			M	SD,R,NS
5/15/93	620	4.2	F	B,NR,NS
5/15/93			F	B,NR,NS
5/15/93	670	3.2	F	B,R,NS
5/15/93			F	B,NR,6H
5/15/93	850	4.3S1S1	F	SD,R, TORN DORSAL
5/15/93			F	SD,R,NS
5/16/93	770	R.3	F	SD,NR,7H
5/16/93			F	SB,NR,NS
5/16/93	795	R.2S1	F	SD,R,6H, RED-BLACK STREAMER
5/16/93			F	SB,NR,NS
5/16/93	750	3.2	F	SB,R,7H
5/16/93			F	SB,R,7H
5/16/93	765	4.3	F	SB,NR,1H,7H
5/16/93			F	B,NR,1H
5/16/93	710	R.3	F	B,NR,1H

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DATE	LENGTH	AGE	SEX	COMMENTS <sup>a</sup>
5/16/93			F	B, NR, 1H
5/16/93	630	3.2	F	B, R, NS
5/16/93			F	B, NR, NS
5/16/93	590	3.2	F	B, R, NS
5/16/93			F	B, R, NS
5/16/93	730	5.2	F	B, NR, 6H
5/16/93			F	B, NR, 6H
5/16/93	775	R.3	F	B, NR, 1H
5/16/93			F	SB, NR, 6H, 7H
5/16/93	695	R.2S1	F	B, R, 1H, 6H
5/16/93			M	SB, NR, 6H
5/17/93	690	4.2	M	SD, R, 1H
5/17/93			F	B, R, NS
5/17/93	790	R.3	F	SB, R, NS
5/17/93			F	SB, R, NS
5/17/93	710	3.3	F	B, NR, 1H
5/17/93			F	SB, NR, NS
5/17/93	650	4.2	F	B, R, NS
5/17/93			F	SB, NR, 6H
5/17/93	850	3.2S1	M	SD, R, NS, TRR
5/17/93			F	SD, R, NS
5/18/93	560	3.2	M	SB, R, NS
5/18/93			F	SB, R, NS
5/18/93	825	4.3	F	SB, R, NS
5/18/93			F	SB, R, 6H
5/18/93	760	3.2S1	F	B, R, NS
5/18/93			F	B, R, 7H
5/18/93	830	R.3	F	B, NR, NS
5/19/93			F	B, R, NS
5/19/93	875	R.3S1	F	B, NR, 6H, 7H
5/19/93			F	SD, NR, NS
5/19/93	580	R.2	F	B, R, NS
5/19/93			F	B, NR, NS
5/19/93	630	3.2	M	SD, R, 7H
5/19/93			F	SD, R, 6H
5/19/93	795	R.3	F	B, R, NS
5/19/93			M	SD, R, 2H
5/19/93	750	4.3	F	B, R, NS
5/20/93			F	B, R, 1H
5/21/93	750	3.3	F	SB, R, 1H, TRR, FISH DIED, SPLIT DORSAL
5/21/93			F	B, R, 2H
5/21/93	760	3.3	F	B, R, 7H
5/21/93			M	SB, R, NS
5/21/93	700	R.3	F	B, R, NS
5/21/93			F	B, NR, NS
5/21/93	815	4.3	F	B, NR, 6H
5/21/93			F	B, NR, 1H
5/22/93	880	R.2S1S1	M	D, R, NS
5/22/93			M	SD, R, NS
5/22/93	770	3.3	M	SB, R, NS
5/22/93			M	SD, R, 6H
5/22/93	730	R.3	F	B, R, NS
5/23/93			F	B, R, 6F, 7H
5/23/93	790	4.2S1	F	SB, R, NS
5/23/93			M	SD, R, 6H

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DATE	LENGTH	AGE	SEX	COMMENTS <sup>a</sup>
5/23/93	770	3.3	F	B,R,NS
5/24/93			F	B,NR,1H
5/25/93	685	R.2	F	B,NR,7H
5/25/93			M	SD,R,7H
5/25/93	780	R.3	F	SB,R,NS
5/25/93			F	B,NR,NS
5/25/93	610	3.2	M	SD,R,NS
5/26/93			F	B,R,7H
5/26/93	930	R.2S1	M	SD,NR,NS
5/26/93			F	SB,R,1H
5/26/93	600	3.2	F	B,R,NS
5/28/93			F	B,R,NS
5/28/93	920	R.2S1S1	F	SB,NR,6H
5/28/93			M	SD,R,2H
5/29/93	780	4.3	F	B,NR,NS
5/29/93			M	D,R,5F,7H
5/29/93	850	3.3	M	SD,R,5F
5/29/93			F	B,R,NS
5/29/93	780	R.3	F	B,NR,1H
5/30/93			F	B,R,1H
5/30/93	800	4.3	F	B,NR,7H
5/30/93			F	B,R,NS
5/30/93	610	3.2	M	B,R,NS
5/31/93			F	B,NR,NS
5/31/93	720	4.3	F	SB,R,7H
6/1/93			M	SD,NR,NS, SPLIT TAIL

<sup>a</sup> Key to abbreviations: B = bright; SB = semi-bright; D = dark; SD = semi-dark; R = ripe; NR = not ripe; NS = no scars; TRR = resuscitation required before release; F = fresh scar; H = healed scar; Photo = photograph taken; Numbers 1-7 = scar category A-G (1=A, 2=B, etc.);

Appendix A3. Freshwater age composition and length at age of downstream migrating steelhead smolt sampled at Sitkoh Creek, 1993.

Freshwater age	Mean length (mm)	SD	Min. length (mm)	Max. length (mm)	n	%
3	161.5	11.1	145	180	13	16
4	187.7	15.1	160	220	43	54
5	217.8	14.5	190	245	16	20
6	240.0	21.2	225	255	2	2
? <sup>a</sup>	203.3	31.4	160	235	6	8
Overall	191.9	24.8	160	310	80	

<sup>a</sup> Regenerated, ages undetermined

Appendix A4. Freshwater age composition and mean length, by sex, of steelhead smolt sampled at Sitkoh Creek, 1993.

Freshwater age	Female			Male			Combined
	Mean length	n	SD	Mean length	n	SD	n
3	163.2	6	12.3	160.0	7	10.8. 6	13
4	183.5	23	12.1	192.5	20	16.9	43
5	218.3	12	14.0	216.3	4	18.0	16
6	225.0	1		255.0	1		2
? <sup>a</sup>	190.0	3	39.7	216.7	3	18.9	2
Overall	191.4	45	24.0	192.6	35	26.1	80

<sup>a</sup> Regenerated, ages undetermined

Appendix A5. List of data files used to analyze data and prepare this report.<sup>a</sup>

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Data file	Description
SIT93AWL.DBF	Steelhead length, age, sex, and date and time of upstream passage through weir.
SIT93DWN.DBF	Downstream kelt counts, including date, time, and water level and temperature.
SIT93JUV.DBF	Juvenile and adult rainbow/steelhead captured and genetically sampled; includes date, length, and sex.
SIT93WAT.DBF	Daily water temperature, level, and weather observations.
SIT93WER.DBF	Upstream steelhead counts by sex; includes those fish passed through weir but not measured.
SITSUM.SAS	SAS code written to sum and analysis project data.

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<sup>a</sup> Data files have been archived at, and are available from, the Alaska Department of Fish and Game, Division of Sport Fish, Research and Technical Services, 333 Raspberry Road, Anchorage, Alaska 99518-1599.